THE PRODUCTION AND PROPERTIES OF RADIOACTIVE HYDROGEN AND OTHER RADIOACTIVE INVESTIGATIONS

BY
RUSSELL DEWITT O'NEAL
B.A., DePauw University, 1936
M.S., University of Illinois, 1938

AN ABSTRACT OF A THESIS
SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN
PHYSICS IN THE GRADUATE SCHOOL OF THE
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URBANA, ILLINOIS
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A new method, that of varying the pressure inside a screen wall Geiger counter, has been used for measuring the range of very low energy electrons and in this manner the upper limit of the β- spectrum for H^3 has been obtained. This is 15 ± 3 k. e. v. Also the reaction

$$Be^9 + D^2 \rightarrow Be^8 + H^3$$

has been confirmed.

A new method for measuring long half-lines, i.e., that of measuring N′ and N in the reaction $N' = N\lambda$, was used to measure the half-life of H^3. This H^3 was produced by bombardment of lithium with slow neutrons. A 100 mg. Ra - α- Be neutron source was used. The half-life of H^3 determined in this manner is 31 ± 8 years. These energy and half-life measurements have been used to check Fermi's theory of β-decay for this extremely low energy. The agreement between theory and experiment has been found to be as good as one could expect.

This new method of measuring half-lives has also been applied to the measurement of the half-life of $Cl.^{36}$. Here due to the low intensity source of neutrons available, it was possible to put only a lower limit on this extremely long half-life. This lower limit is 1000 years.

VITA

Russell DeWitt O'Neal was born February 15, 1914, in Columbus, Indiana. He received his elementary education in the same town. In 1936 he received the degree of Bachelor of Arts from DePauw University and in 1938 he received the degree of Master of Science from the University of Illinois. From 1936 to 1940 he was an Assistant in Physics at the University of Illinois. During the year 1940-41 he has been a Graduate Fellow at the same university. He is a member of Phi Beta Kappa, Sigma Xi, and The American Physical Society.